

NOTES ON THE DISTRIBUTION, ECOLOGY AND TAXONOMY
OF THE RED-CROWNED PIGEON (*PTILINOPUS REGINA*)
AND TORRES STRAIT PIGEON (*DUCULA BICOLOR*)
IN WESTERN AUSTRALIA

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ABSTRACT

Data on distribution, status, habitat, food, breeding and colour of soft parts are given for the Red-crowned Pigeon (*Ptilinopus regina ewingii*) and the Torres Strait Pigeon (*Ducula bicolor spilorrhoea*) in Kimberley, Western Australia. Geographic variation in both species is analysed. Three subspecies are recognised in the Red-crowned Pigeon, *P. r. regina* of eastern Australia, *P. r. ewingii* of Northern Territory, Kimberley and Lesser Sunda Islands, and *P. r. xanthogaster* of the Banda and Kei Islands; four in the Torres Strait Pigeon, *D. b. bicolor* from India to northwest New Guinea, *D. b. luctuosa* of Sulawesi, *D. b. spilorrhoea* of Australia and mainland New Guinea and *D. b. subflavescens* of the Bismarck Archipelago and Admiralty Islands.

INTRODUCTION

This paper is the first of a series on Kimberley pigeons. Thirteen native species of pigeon inhabit Western Australia; only one of them, the Brush Bronzewing (*Phaps elegans*), does not occur in the Kimberley. Five species, namely the Red-crowned Pigeon (*Ptilinopus regina*), Torres Strait Pigeon (*Ducula bicolor*), Green-winged Pigeon (*Chalcophaps indica*), White-quilled Rock Pigeon (*Petrophassa albipennis*) and the Partridge Pigeon (*Geophaps smithii*) are in Western Australia restricted to the Kimberley Division.

Sir George Grey was the first to record the Torres Strait Pigeon in Western Australia. On 17 December 1837 he collected two specimens at Hanover Bay (near the mouth of Prince Regent River) which he presented to the British Museum in 1840. G.F. Hill, who recorded and collected birds at Napier Broome Bay from August 1909 to July 1910, was the first to observe and collect a specimen of the Red-crowned Pigeon in Western Australia. He was

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also informed by Aborigines that a large white pigeon occurred there, and he often heard birds which he believed were Torres Strait Pigeons. Nothing more was learnt of these two pigeons in this State until the early 1970s when the Department of Ornithology and Herpetology of the Western Australian Museum, often in conjunction with the Department of Fisheries and Wildlife, began extensive survey work in the Kimberley. Much of the data presented in this paper resulted from these surveys. I am grateful for additional unpublished data from Mr W.H. Butler and Mrs H.B. Gill.

In both the Red-crowned and Torres Strait Pigeons it has been necessary to study specimens from other parts of Australia, New Guinea and southeast Asia to determine the taxonomic status of Western Australian populations.

MATERIALS AND METHODS

Ninety-six Red-crowned and 53 Torres Strait Pigeon specimens held in the Western Australian Museum, Australian National Wildlife Collection, National Museum of Victoria, British Museum (Natural History) and Rijksmuseum van Natuurlijke Histoire, Netherlands, were examined. Measurements of specimens were taken as follows: length of chord of flattened wing, length of tail to the outside base of central rectrix, length of tarsus and length of entire culmen.

RED-CROWNED PIGEON

Ptilinopus regina

Distribution

Storr (1980) gives the distribution in Kimberley as the subhumid north-west sector of the Kimberley Division from Napier Broome Bay southwest to Kunmunya, including several islands in the Bonaparte Archipelago, with an isolated population on the far north of Dampier Land (see Fig. 1).

Fig. 1: Distribution of *Ptilinopus regina regina* (north of Cardwell, Queensland), *P. r. ewingii* in Northern Territory and Western Australia and *P. r. ewingii*, *P. r. 'roseipileum'* and *P. r. xanthogaster* in Lesser Sunda Islands.

P. r. regina: 1 Cardwell, Rockingham Bay, Hinchinbrook Island, South Brook Island; 2 Dunk Island; 3 Innisfail, Mission Beach; 4 Yungaburra; 5 Cairns, Yarrabah; 6 Port Douglas; 7 Bloomfield River; 8 Cooktown; 9 Claudie River, Iron Range; 10 Somerset; 11 Prince of Wales, Booby, Thursday and Horn Islands; 12 Banks Island; 13 Darnley Island; 14 Edward River.

P. r. ewingii: 15 Sir Edward Pellew Group; 16 Groote Eylandt; 17 Port Bradshaw, Yirrkala; 18 Cobourg Peninsula (Reef Point, Black Point, Smith Point, Point Priest, Port Bremer); 19 Nourlangie; 20 South Alligator River; 21 Melville Island; 22 Darwin (East Point, Thring Creek, Cannon Hill, Mica Beach, Buffalo Point, Howard Springs, Shoal Bay); 23 Quail Island (Port Patterson); 24 Daly River; 25 Port Keats; 26 Kalumburu, Napier Broome Bay; 27 South West Osborne Island; 28 Hunter River; 29 St Andrew Island; 30 Kunmunya; 31 Cygnet Bay.

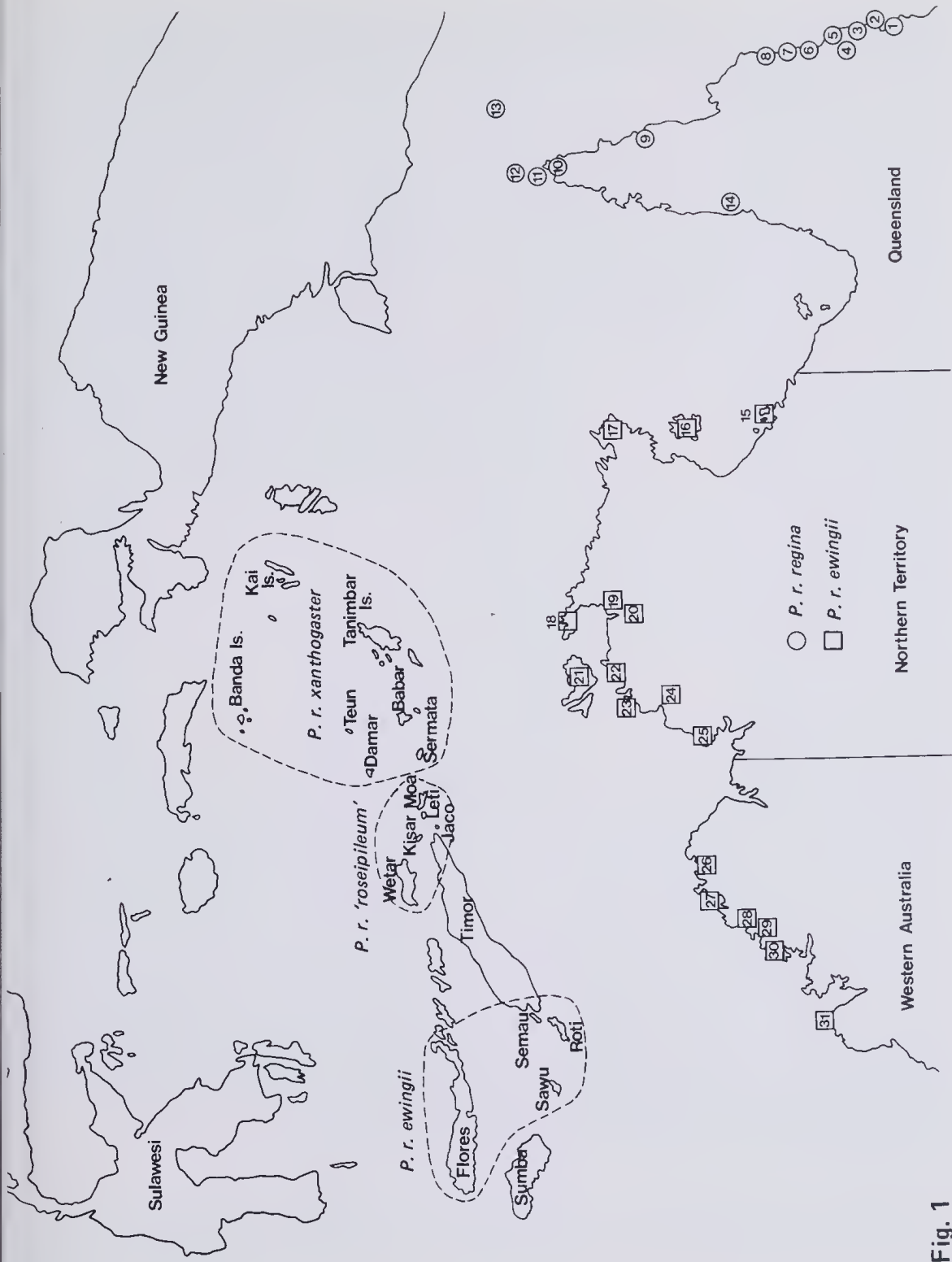


Fig. 1

Status

Scarce, in ones, twos and threes on the northwestern mainland and islands. Uncommon to moderately common in flocks of up to five in northern Dampier Land.

Ecology

This pigeon is restricted to coastal semi-deciduous vine forest and thicket, mangal and tall melaleuca forest and woodland. The semi-deciduous vine forests, thickets and scrubs are best developed on coastal basalts where mean annual rainfall exceeds 1200 mm. The forests on the Osborne Islands are the richest in Kimberley; here and at the mouth of the Hunter River the vine forests are contiguous with closed mangrove forests which this pigeon also frequents. In the semi-deciduous vine forests the canopy closes at 3-9 m; the emergents (mostly deciduous) rise to 15 m and include *Bombax ceiba*, *Albizia lebbek*, *Celtis philippensis*, *Randia cochinchinensis*, *Ficus* spp., *Eugenia* spp., and *Zizyphus quadrilocularis*. The middle level consists mostly of slender trees and shrubs, and the lowest level is dominated by vines and spiny shrubs. On Dampier Land the Red-crowned Pigeon occurs in more open vine forests and scrubs growing on the landward side of coastal dunes and in near-coastal melaleuca thickets and forests (*Melaleuca leucadendron* and *M. acacioides*). The vine forests here consist of *Celtis*, *Ficus virens*, *Ficus dasycarpa*, *Ficus opposita*, *Terminalia*, *Cassine melanocarpa*, *Diospyros ferrea*, *Melaleuca* and often scattered *Eucalyptus*.

During the day the pigeons seldom leave the canopy and if disturbed prefer to fly below the canopy rather than above it. In flight the wings make a silky swishing noise. The call consists of about three short coos followed by a laughing sound, the coos commencing slowly and increasing in volume and the laughing sound decreasing in volume and descending in pitch.

The crops of two specimens collected on South West Osborne Island contained the fruits of *Zizyphus quadrilocularis*. Birds have been observed feeding on the fruit of *Mimusops elengi*.

Breeding

Two males and one female were collected on 28 June 1973 on South West Osborne Island. The female weighed 85 g and had a well-developed ovary (largest follicle 4 x 4 mm) and highly convoluted oviduct. The males weighed 85 and 86 g and had enlarged testes. It seems that these birds had recently bred.

Soft Parts

Bill green, iris yellowish orange (some specimens light brown), legs dark greenish grey and mouth greenish grey.



Fig. 2: Ventral and dorsal coloration in subspecies of *Ptilonopus regina*. Left to right: *P. regina regina* (CSIRO 5398 ♂ NSW); *P. r. ewingii* (CSIRO 6508 ♂ NT); *P. r. 'roseipileum'* (CSIRO 30202 ♂ Timor) and *P. r. xanthogaster* (CSIRO 14269 Taam Island [Kai Islands]).

Geographic Variation

The nominate subspecies *Ptilinopus regina regina* occurs in eastern Australia. Its distribution in Queensland is outlined by Storr (1973). In New South Wales it extends south to about Port Stephens. As a vagrant it has been recorded in Victoria and even as far south as Tasmania. New South Wales birds are described as follows: cap reddish purple, finely edged behind with yellow to above the eye (some specimens have little or no yellow edging); lore whitish; mantle greyish green in male, green (same as back colour) in female; rest of upper parts green, wing coverts and secondaries edged yellow and tertials and some coverts with dark blue spots, and tail broadly tipped yellow or yellowish white; chin whitish yellow; throat dull yellowish white; breast dark green (the bifid feathers tipped with silver-grey); belly patch pale reddish purple (often reduced to a few feathers); rest of belly and flanks reddish orange, becoming more yellow towards vent; under tail coverts reddish orange in male, yellow or yellowish orange in female; under tail grey; tip of tail yellowish white.

Although the range of *regina* on the eastern side of Cape York Peninsula is broken, birds show little geographic variation. Specimens from Cape York and Cairns and the Cape York bird pictured by Mathews (*Birds of Australia* 1: 105, pl. 22) are all large and dark, like those from New South Wales. The most distinctive specimens that I have seen from the east coast are those from Mission Beach (near Innisfail, Queensland); these birds are larger than other *regina* and have more white in the lore/supercilium and a larger pink belly patch; they are slightly more yellowish on the upper surface, and the undertail coverts of the males have a large reddish spot near the tip (as in several New South Wales specimens).

Frith (1952) indicated that *regina* has strong nomadic or migratory tendencies. It is therefore possible that the dark birds from Cape York are migrants from the south. Living on the wettest coast of Australia, the Mission Beach population has a good food supply all year, whereas New South Wales birds need to disperse northwards.

Storr (1973) listed an isolated population (of unknown subspecies) about the lower Edward River on the midwest coast of Cape York Peninsula. Four specimens were collected there in September-October 1928 by D.F. Thomson. These specimens are similar in size to nominate *regina*, but in coloration the males in particular are most like the Kimberley and Northern Territory subspecies *ewingii*. They have more yellow on the chin and throat than typical *regina*, the breast is paler (the bifid silver-grey tipped feathers on the breast have a lighter green base), the belly patch is pinkish, and the feathers above the belly patch are tipped yellow forming a pectoral band

TABLE 1
Showing measurements (mm) of *Ptilinopus regina*.

Subspecies	Locality	Number		Wing	Tail	Tarsus	Culmen (entire)	Weight
<i>regina</i>	New South Wales	♂	15	121-135	69-82	14-23	18-21	100-118
		♀	9	114-132	68-80	16-21	18-20	75-110
<i>regina</i>	Cape York, Cairns, and Mission Beach, Queensland	♂	4	130-135	78-85	20-23	18-20	112-120
		♀	2	126,127	77,81		18,21	103
<i>regina</i>	Edward River, Queensland	♂	2	125,132	74,88	19,22	18,20	
		♀	3	115,122	68-70	19	17-19	
<i>ewingii</i>	Northern Territory	♂	19	115-128	66-79	19-20	17-20	73-95
		♀	20	112-121	65-75	15-21	17-21	57-86
<i>ewingii</i>	Kimberley, Western Australia	♂	3	116-119	75-78		17-18	84-86
		♀	1	121	74		17	85
<i>ewingii</i>	Sawu and Roti	♂	3	116-120	69-75		17-18	
		♀	3	110-120	68-75	16-17.5	16-17.5	
' <i>roseipileum</i> '	Timor, Kisar,	♂	3	112-118	68-76	17-20	17-19	89
<i>xanthogaster</i>	Kai Is, Taam, Teun, Babar, Banda	♂	5	116-129	70-77	18-20	19-20.5	84-114
		♀	3	117-122	69-75	16-19	18.5-19	
		0	2	124,126	79	19,21		

(more pronounced in males). The band is not as bright or as broad as in *ewingii* (typical *regina* has no trace of breast band). The cap at Edward River is pinkish edged yellow; although the yellow edging is not as bright as in *ewingii* it is better defined than in typical *regina* and remains yellow above the eye. The males are also more greyish on the mantle than other Cape York Peninsula specimens. The paler coloration of the Edward River birds is correlated with climate; the rainfall here is similar to Kimberley and Northern Territory which is lower and more seasonal than within the range of typical *regina*. It is also noteworthy that Mathews included Cape York within the range of *ewingii*, thus separating a northern population (*ewingii*) from a southern (*regina*).

In the Northern Territory *ewingii* is confined to northern islands and coasts from Port Keats to the Sir Edward Pellew Group (see Fig. 1 and Storr 1973). *P. r. ewingii* is smaller than nominate *regina* (see Table 1) and differs considerably in colour (see Fig. 2). The cap in *ewingii* is pale reddish pink edged yellow, whereas *regina* has a reddish purple cap edged yellow (which sometimes becomes white above the eye). The throat in *ewingii* is more yellowish; the breast is paler (the bifid breast feathers are basally greyish green or lime green rather than dark green); the belly patch is pink,

slightly paler than cap rather than pale reddish purple. In *regina* there is little or no trace of a bright band above the belly patch; in *ewingii* this band is orange below, yellow above (see Fig. 2). The flanks and lower abdomen in *ewingii* are orange, rather than reddish or reddish orange. In *ewingii* both males and females have the undertail coverts yellowish orange, whereas *regina* males are darker orange and females all yellow. Adult males of both *ewingii* and *regina* have a pale mantle (greyish, bluish grey or bluish grey-green) but this is more distinctive in male *ewingii*. Females of both races have the mantle a uniform green, the same as the back.

Mathews (1912) named the race *melvillensis* from Melville Island; it supposedly differed from *ewingii* in its paler head and back and in its light grey mantle. This however describes the difference between adult male and female *ewingii*. It appears that Mathews was unaware of sexual dimorphism in *ewingii* or *regina*. It is interesting that in a series of seven adult *ewingii* from Centre Island (Sir Edward Pellew Group), Northern Territory, three specimens (CSIRO 5717, 19536 and 19535) have dark backs (more bluish green) and are less yellow on the throat and breast and more whitish on the tail than in normally coloured *ewingii* from the same island. In back and throat colour they are tending towards *regina*, which may indicate some gene flow between northern populations of *regina* and eastern populations of *ewingii*. The Pellew Islands are at the eastern limit of *ewingii* and about 500 km west of the Edward River population of *regina* (see Fig. 1).

Goodwin (1967) included birds from the lesser Sunda Island, Flores, Sawu, Semau, Roti and Timor within the race *flavicollis*, which he stated was similar to *ewingii* except for a strong yellow-green suffusion on the neck and breast. Specimens from Savu and Roti Islands are in size and coloration almost identical with Kimberley and Northern Territory specimens. As a series they are slightly paler on the breast and flanks; however many *ewingii* are more yellowish on the throat and neck than the Sawu and Roti Island specimens. Mathews (1911) also concluded that birds from Sawu Island did not differ from those of the Northern Territory.

Hartert (1904) described the race *roseipileum* from the lesser Sunda Islands, mainly because of its rosy crown (see Fig. 2). It occurs on the islands of Timor, Wetar, Roma, Kisar, Moa and Leti (see Fig. 1). Hartert compared it with *P. r. xanthogaster* (Wagler) of the Banda and Kai Islands and Damar, Sermata, Babar, Teun, Nila and Tanimbar (see Fig. 1). *Xanthogaster* is described as follows:

Crown: light grey to dark grey, several specimens with a trace of reddish orange around the yellow edging (compared to light cream tinged with rosy in *roseipileum*, and reddish pink in *ewingii*);

Mantle: pure grey in male, grey tinged greenish in female (more bluish grey or greenish grey in *roseipileum* and *ewingii*);

Back and wings: dark green — darkest in Banda Island specimens (paler, more yellowish green in *roseipileum* and *ewingii*);

Tertials and coverts: with more extensive dark blue spotting in *xanthogaster* than in *roseipileum* and *ewingii*;

Tail: dark green — iridescent green in Banda Island males, with more white in tip (pale green with more yellow in tip in *roseipileum* and *ewingii*);

Belly patch: grey (pale grey in *roseipileum* and pink in most *ewingii*);

Belly and flanks: yellowish orange (yellowish orange in *ewingii*, yellowish in *roseipileum*);

Breast band: yellow or pale yellow (yellow in *roseipileum*, yellow and orange in *ewingii*);

Breast feathers: wholly pale grey in male, basally pale olive-green in female tipped pale grey.

Subspecies Recognized

In size and coloration *roseipileum* is very similar to *ewingii*, differing only slightly in crown, belly and flank colour. However some adult *ewingii* (in new plumage) resemble *roseipileum* in having the reddish pink of the crown and belly partly replaced with greyish pink. Birds with pale and dark pink crowns (respectively *roseipileum* and *ewingii*) have been collected on Timor, but little is known of the distribution of each form on the island. The single Timor *roseipileum* from Baucau matches perfectly with birds from Kisar and Letti Islands. In several characters, especially crown and belly colour, *roseipileum* is intermediate between *xanthogaster* and *ewingii*.

The easternmost population of *ewingii* (Pellew Islands) and westernmost *regina* (Edward River) also show some intermediacy in back, throat and breast colour. Further work is necessary in the Lesser Sunda Islands and in northeastern Australia to clarify the status of both *xanthogaster* and *ewingii*.

Meanwhile I propose recognition of three subspecies: *Ptilinopus regina regina* Swainson, *P. r. ewingii* Gould (including *flavicollis* Bonaparte, *roseipileum* Hartert and *melvillensis* Mathews), and *P. r. xanthogaster* (Wagler).

TORRES STRAIT PIGEON

Ducula bicolor spilorrhoea

Distribution

In Western Australia it is confined to subhumid northwest Kimberley from Cape Londonderry southwest to Kunmunya (see Fig. 3). There is an unconfirmed report of this species further south; in his book *Land of Opportunities* E.J. Stuart describes 'two beautiful black and white pigeons as big



Fig. 3: Distribution of *Ducula bicolor* in Kimberley, Western Australia: 1 Cape Londonderry; 2 Drysdale River (National Park); 3 Morgan River; 4 Napier Broome Bay; 5 Sir Graham Moore Island; 6 South West Osborne, Carlia and Borda Islands; 7 Admiralty Gulf; 8 Lawley River; 9 Mitchell River; 10 Bigge Island; 11 Roe River; 12 Prince Frederick Harbour, Hunter River mouth and Boongaree Island; 13 Coronation Island; 14 Prince Regent River; 15 St George Basin, St Andrew Island and Byam Martin Island; 16 Kunmunya; 17 Augustus Island.

as magpies', which were no doubt Torres Strait Pigeons but the precise locality where he shot the birds is uncertain.

Status

In Kimberley it is moderately common, mainly occurring in small flocks of up to 25. Unlike the Northern Territory and Queensland populations, which arrive from southern New Guinea between August and October and leave in March-April (Storr 1973, 1977), the Kimberley population is resident. Small flocks are present throughout the year, and breeding has been recorded in August, the earliest month for Australia.

Ecology and Habitat

This pigeon is mainly found in semi-deciduous vine forests rich in fruiting

trees and shrubs, including *Ficus* spp., *Randia*, *Terminalia*, *Eugenia*, *Zizyphus* and *Celtis*. It also occurs in mangrove forests, evergreen thickets of *Ficus* at the foot of cliffs and along gullies, and waterside vegetation (especially tall *Melaleuca leucadendron*).

No single block of forest in Kimberley is big enough to support large flocks of Torres Strait Pigeons throughout the year. Moreover the amount of fruit available at any one place fluctuates widely from season to season, so that this species (and many other frugivorous birds) must search a large area for food. During the dry season there is a tendency for birds to disperse from the forest areas to offshore islands, riverside vegetation and eucalypt woodland. This movement and the consequent dispersal of seeds is probably instrumental in the establishment of new vine forests.

The rich lowland forests of southern New Guinea support huge wintering flocks from the Northern Territory and Queensland. Western Australia however has no large land mass rich in forests to the immediate north where Kimberley birds could spend the winter. This explains the small numbers in Western Australia and their relatively sedentary way of life. Predation by Aborigines may also have kept numbers down in certain areas. Hill, who spent 11 months at Napier Broome Bay between August 1909 and July 1910, did not record the Torres Strait Pigeon. Two were shot at Parry Harbour by mission Aborigines prior to his arrival and he heard pigeons that he believed were referable to this species. They were certainly not as common in this area as they are now.

Although mostly feeding in the canopy this species will venture close to the ground when feeding in low thickets or in isolated fruiting trees. Their flight is fast and direct, but not fast enough to elude Peregrine Falcons on South West Osborne Island; here the open space between the cliffs and the vine forest below the falcons' roost was thickly carpeted with bones and white feathers.

Food

The crop of a specimen collected in mangal on Augustus Island in May 1972 contained seeds of *Randia cochinchinensis* and mangrove buds. They also feed on the fruits of *Ficus platypoda*, *F. virens* and *Eugenia* spp.

Breeding

For details of the only nest found in Kimberley see Dell (1978). A female collected on 2 February 1972 at Mitchell Plateau had a well-developed ovary and a highly convoluted oviduct; another female collected on 24 October 1976 at the same place had a large ovary with two developing egg follicles. Two males collected on 30 September 1978 at Mitchell Plateau had large testes which indicated breeding.

Soft Parts

Bill greenish yellow (N 15), iris dark brown, legs lead grey or bluish grey and mouth pink to grey.

Weight

Adult males (N 5) 400-550 g, adult females (N 5) 371-510 g.

Geographic Variation

Previous authors have treated the Torres Strait Pigeon as a full species (*Ducula spilorrhoea*), distinct from the Pied Imperial Pigeon (*Ducula bicolor*).

Rand (1941) recognised four subspecies within *Ducula spilorrhoea*: the nominate form *D. s. spilorrhoea*, which occurs in scattered isolated populations on the islands and mainland of New Guinea; *D. s. subflavescens* (Finsch) of the Bismarck Archipelago and Admiralty Islands; *D. s. tarara* Rand of southern New Guinea from the Fly River west to at least Merauke; and *D. s. melvillensis* Mathews of northern and eastern Australia and the Hall Sound region of New Guinea. *D. s. melvillensis* was characterized by having the head distinctly grey-tinged. However Australian birds show considerable variation in the greyness of the head and back, the amount of black on the outer tail feathers, the amount of black spotting under the tail, and the degree of yellow tinging to plumage. All adult Kimberley specimens have a grey head. The amount of black on the outer tail feathers ranges from 5 to 32 mm (measured along the shaft). Kimberley birds are also well spotted on the under tail coverts. An adult male from Mitchell Plateau has a silver grey bloom on the dark wing feathers. An immature from the same place has the head whitish, the upper-parts and breast tinged grey, black on the outer tail feathers reduced, and pale greyish brown blotches under the tail finely peppered with black.

Not all Northern Territory birds have the head grey. In fact in his description of *melvillensis* (from Melville Island) Mathews states that it differs from *spilorrhoea* in having the base of the feathers 'much more yellow' and the bill 'more robust'; he does not mention any grey on the head or body. In a small series of four birds from the Alligator River, Northern Territory, two are white-headed and two grey-headed.

Most Queensland specimens have little or no grey tinge on the back, a white head and reduced black on the outer tail feathers.

Rand (1941) in his diagnosis of *tarara* stated that it differed from *melvillensis* in having the head deeper grey and the body plumage above and below grey-tinged. He also stated that though there was considerable variation in the depth of the grey on the body, no specimen lacked a grey head. Of the 24 New Guinea birds I studied, four were from the Gulf of Papua (near the

range of *tarara*), three from the upper Sepik drainage, and 17 from south-eastern New Guinea (Port Moresby district and Grange Islands); four of them were collected in February, two in March, three in May, one in June, three in November and 11 in December. At least 18 of these (the November to February birds) would have been New Guinea breeders; however only one shows the *tarara* characters of grey head and grey tinge to back (but wings white); one other has a good grey head but has the rest of the plumage pure white; two have the head tinged grey similar to Western Australian and Northern Territory birds; seven have a slight tinge of grey on the head; and seven have pure white heads with no trace of grey.

Mayr (1941) also recognised two races in southern New Guinea, *D. s. tarara* the resident subspecies, and *D. s. spilorrhoea* a non-breeding migrant from Australia, restricted in New Guinea to Hall Sound.

Almost all Queensland and Northern Territory birds leave Australia in March-April, presumably for New Guinea. I believe that many, if not most, of the birds winter in the Fly River delta, where Bell (1967) recorded flocks of thousands in July 1965; in October of the same year constant aerial observation by him, showed greatly diminished numbers in the delta. At any rate it is very unlikely that the large number of birds in Australia could all winter in the Hall Sound region, as the current classification implies.

I believe that Rand's sample of *tarara* was biased, and that New Guinea breeding birds like those from Australia comprise grey and white variants. I accordingly treat *tarara* and *melvillensis* as synonyms of *spilorrhoea*. This does not deny that there is geographic variation in Australo-Papuan Torres Strait Pigeons. I have already indicated that from Kimberley to Queensland there is a decrease in the amount of grey in the plumage. Even birds from the small Grange Islands are distinctive in having reduced black on the outermost tail feather. Much more distinctive are the birds from the Admiralty Islands and the Bismarck Archipelago (*subflavescens*); they are characterized by a distinct yellow tinge to the white plumage and large black spots under the tail. This population is also sedentary.

The Pied Imperial Pigeon *Ducula bicolor bicolor* seems to vary little in its huge distribution from the Bay of Bengal eastwards to the Philippines and the islands off northwest New Guinea. Compared with the Torres Strait Pigeon it is purer white with no grey tinge (except for juveniles) and little or no black spotting under the tail and on the vent. Goodwin (1967) treats *melanura* of the Moluccas, which always has some black on the under tail coverts and slightly more black on the tail, as a race of *bicolor*, and *D. luctuosa* of Sulawesi, Peling, Banggai and the Sula Islands as a full species. *Ducula luctuosa* differs from *bicolor* in having the dark primaries silver grey edged with black, and slightly more black spotting under the tail (see Fig. 4). A Kimberley specimen of *spilorrhoea* also has a silver grey bloom on the



Fig. 4: Ventral coloration in subspecies of *Ducula bicolor*. Top, left to right: *D. bicolor bicolor*, *D. b. luctuosa*, *D. b. 'melanura'* and *D. b. spilorrhoea*.

dark primaries; and as a group *spilorrhoea* has only a little more black spotting under the tail than *luctuosa*.

Subspecies Recognized

Generally *melanura* and *luctuosa* are intermediate between *D. bicolor* and *D. spilorrhoea* (see Fig. 4 and Table 2). Both specimens of *luctuosa* have spotting under the tail but less than in *spilorrhoea*. However one *bicolor* specimen from Borneo and one from Sanghir Island off Sulawesi have several blackish spots on the vent and under the tail. Both *luctuosa* specimens have the silver grey bloom on the black primaries, but this is also present in some *melanura* and *spilorrhoea*, although slightly less marked. It appears that the Sulawesi and Moluccan breeding populations are augmented by visitors of *D. b. bicolor* during the northern wet season.

In summary this group of pigeons is best treated as one widespread species. I propose the following nomenclature: *Ducula bicolor bicolor* (Scopoli), *D. bicolor luctuosa* (Temminck) (including *D. b. melanura* [Gray]), *D. bicolor spilorrhoea* (Gray) (including *melvillensis* Mathews and *tarara* Rand) and *D. bicolor subflavescens* (Finsch).

As a result of my conclusions on the taxonomic status of *bicolor*, *luctuosa* and *melanura* more work is required to elucidate the distribution, local movements and ecological requirements of these subspecies in Sulawesi and the Moluccas.

TABLE 2
Showing measurements (mm) of *Ducula bicolor*.

Subspecies	Locality		Number	Wing	Tail	Tarsus	Culmen
<i>bicolor</i>	Sulawesi, Borneo	♂	1	232	128	29	31.5
		♀	1	219	111	32	29
		0	1	221	121	31	28.5
<i>luctuosa</i>	Sulawesi, Lombar	♂	1	230	129		35.5
		♀	1	243	142		34
' <i>melanura</i> '	Seran, Batjan and Ambon	♂	2	233,234	121,122	32,32	31,32
		0	2	217,225	117,123	33,33	30,30
<i>spilorrhoea</i>	Kimberley, Western Australia	♂	9	231-248	137-147	22-29	28-32
		♀	6	217-240	129-140	22-29	28-32
<i>spilorrhoea</i>	Northern Territory and Queensland	♂	3	227-232	124-136	25-26	28-32
		♀	1	233	125	28	32
		0	1	220	122	32	30
<i>spilorrhoea</i>	New Guinea	♂	11	229-249	125-144	26-33	30-33.5
		♀	13	223-236	121-130	25-33	31-34

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